NYATHIKAZI LOW COST HOUSING PROJECT, KWADUKUZA MUNICIPLAITY, KWAZULU-NATAL

FOR K2M ENVIRONMENTAL

DATE: 15 MAY 2015

By Gavin Anderson

Umlando: Archaeological Surveys and Heritage Management

PO Box 102532, Meerensee, 3901

Phone/fax: 035-7531785 Fax: 0865445631

Cell: 0836585362

TABLE OF CONTENT

TABLE OF FIGURES

INTRODUCTION

The KwaDukuza Local Municipality proposes the construction of the Nyathikazi Rural Housing Development which will involve the construction of approximately 741 new low cost housing residential units and supporting facilities on Portion 4, 5, 7, 8, 9, 10, 11, 13, 17, 18, 27, 29, 32, 36, 38, 39, 40, 43, 44, 46 and 47 of the Farm Lot 39 No. 1980 owned by the KwaDukuza Local Municipality The development will be situated approximately 2 km northwest of the village of Darnall within the KwaDukuza Local Municipality of KwaZulu-Natal's iLembe District.

The proposed project area has a current land use zoning of "Agriculture" and is predominantly under sugar cane cultivation with the exception of a few areas that are used for farm housing as well as small sections of informal mainly corrugated settlements. Patches of mixed indigenous and alien invasive vegetation occur within and around the farm housing areas. The site is bounded by the Nonoti River floodplain in the south and west, a river in the north as well as existing sugarcane plantations.

The proposed development is likely to comprise of the following components:

- Residential (Approx. 741 sites)
- Community Facility (Approx. 3 sites)
- Commercial (Approx. 3 sites)
- Education – Primary School (Approx. 1 site)
- Worship (Approx. 3 sites)
- Active Open Space (Approx. 5 sites) – Incl. 1 Sportfield
- Passive Open Space (Approx. 24 sites)
- Ex. Cemetery" (K2M Environmental BID 2015)

Figures 1 – 3 indicates the location of the proposed project.

FIG. 1 GENERAL LOCATION OF THE STUDY AREAS

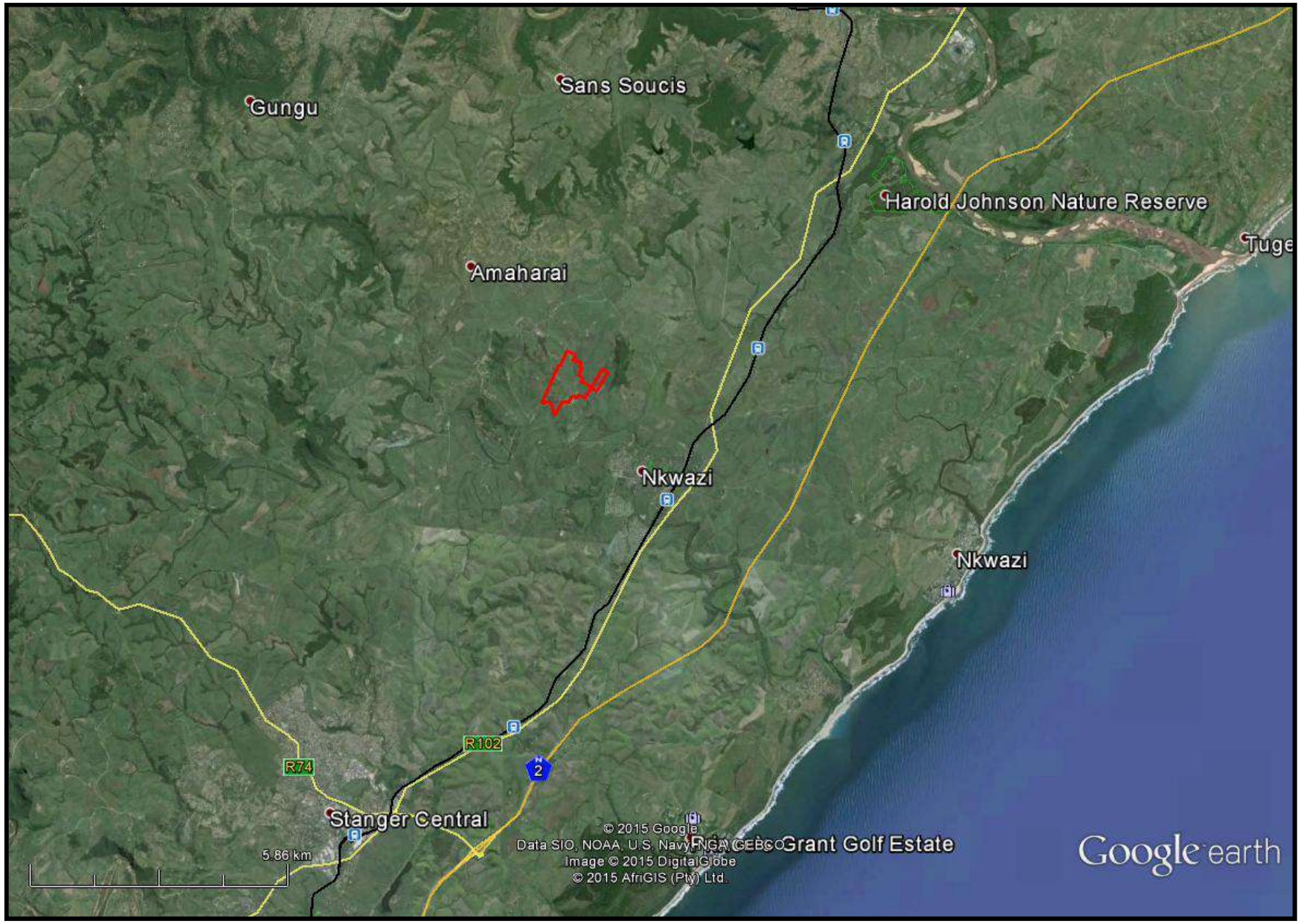


FIG. 2: AERIAL OVERVIEW OF THE MBANGWEINI STUDY AREA

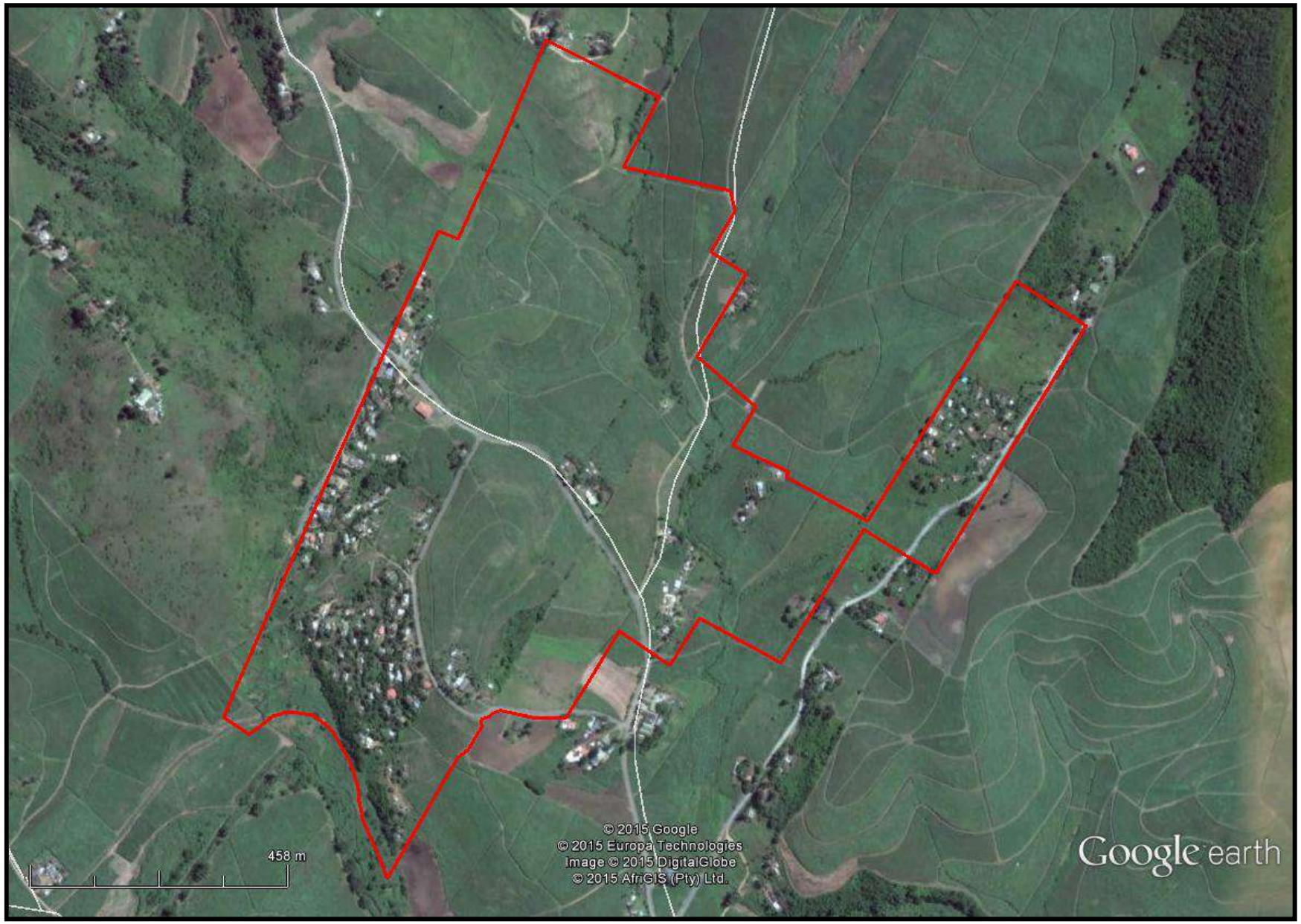
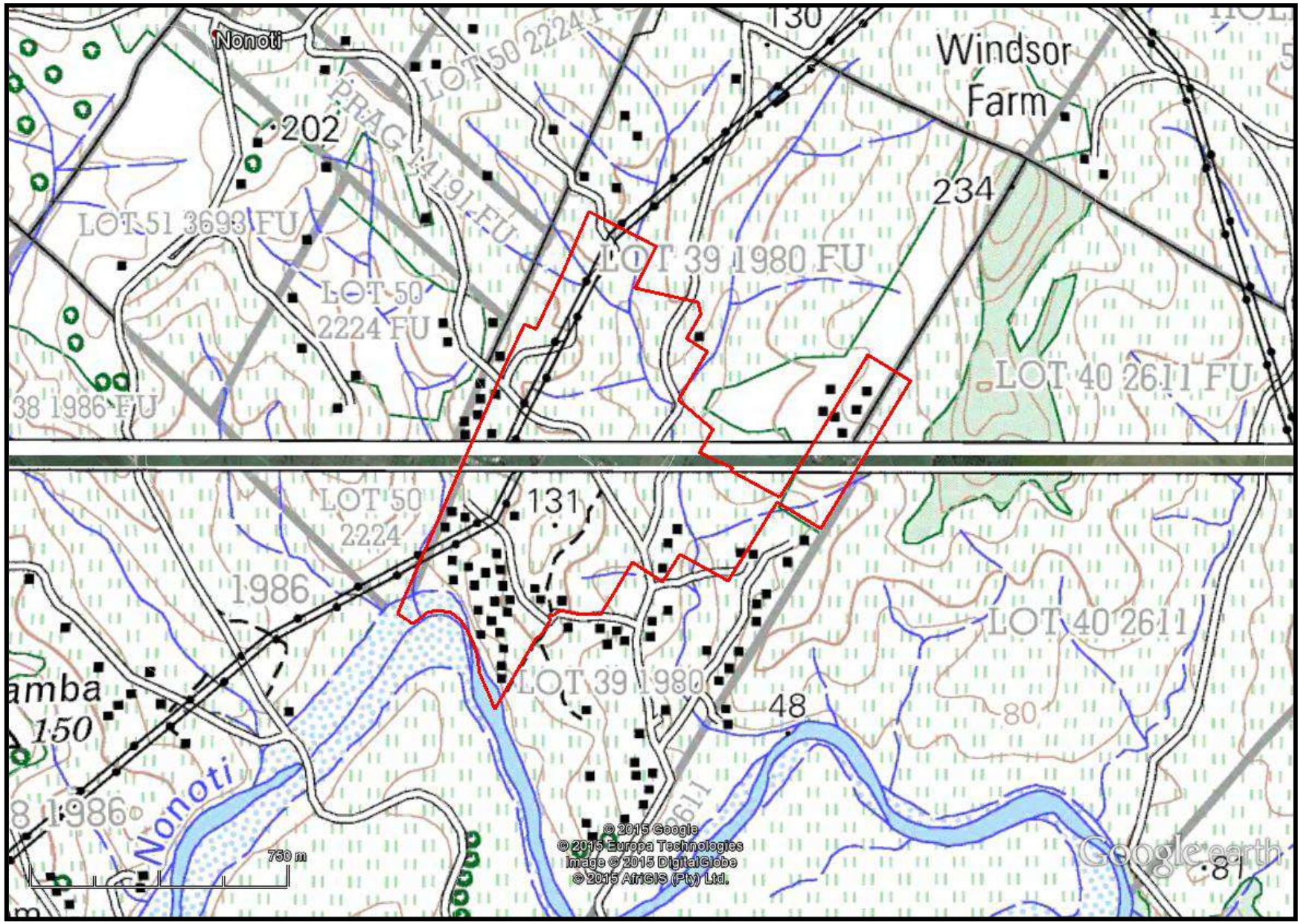


FIG. 3: TOPOGRAPHICAL OVERVIEW OF THE MBANGWEINI & BHEKABANTU STUDY AREAS



KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008

"General protection: Structures.—

- No structure which is, or which may reasonably be expected to be older than 60 years, may be demolished, altered or added to without the prior written approval of the Council having been obtained on written application to the Council.
- Where the Council does not grant approval, the Council must consider special protection in terms of sections 38, 39, 40, 41 and 43 of Chapter 9.
- The Council may, by notice in the *Gazette*, exempt—
- A defined geographical area; or
- defined categories of sites within a defined geographical area, from the provisions of subsection where the Council is satisfied that heritage resources falling in the defined geographical area or category have been identified and are adequately protected in terms of sections 38, 39, 40, 41 and 43 of Chapter 9.
- A notice referred to in subsection (2) may, by notice in the *Gazette*, be amended or withdrawn by the Council.

General protection: Graves of victims of conflict.—No person may damage, alter, exhume, or remove from its original position—

- the grave of a victim of conflict;
- a cemetery made up of such graves; or
- any part of a cemetery containing such graves, without the prior written approval of the Council having been obtained on written application to the Council.
- General protection: Traditional burial places.—
- No grave—
- not otherwise protected by this Act; and
- not located in a formal cemetery managed or administered by a local authority, may be damaged, altered, exhumed, removed from its original position, or otherwise disturbed without the prior written approval of the Council having been obtained on written application to the Council.

The Council may only issue written approval once the Council is satisfied that—

- the applicant has made a concerted effort to consult with communities and individuals who by tradition may have an interest in the grave; and
- the applicant and the relevant communities or individuals have reached agreement regarding the grave.

General protection: Battlefield sites, archaeological sites, rock art sites, palaeontological sites, historic fortifications, meteorite or meteorite impact sites.—

- No person may destroy, damage, excavate, alter, write or draw upon, or otherwise disturb any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site without the prior written approval of the Council having been obtained on written application to the Council.
- Upon discovery of archaeological or palaeontological material or a meteorite by any person, all activity or operations in the general vicinity of such material or meteorite must cease forthwith and a person who made the discovery must submit a written report to the Council without delay.
- The Council may, after consultation with an owner or controlling authority, by way of written notice served on the owner or controlling authority, prohibit any activity considered by the Council to be inappropriate within 50 metres of a rock art site.
- No person may exhume, remove from its original position or otherwise disturb, damage, destroy, own or collect any object or material associated with any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site without the prior written approval of the Council having been obtained on written application to the Council.
- No person may bring any equipment which assists in the detection of metals and archaeological and palaeontological objects and material, or excavation equipment onto any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, or meteorite impact site, or

use similar detection or excavation equipment for the recovery of meteorites, without the prior written approval of the Council having been obtained on written application to the Council.

- The ownership of any object or material associated with any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site, on discovery, vest in the Provincial Government and the Council is regarded as the custodian on behalf of the Provincial Government." (KZN Heritage Act of 2008)

METHOD

The method for Heritage assessment consists of several steps.

The first step forms part of the desktop assessment. Here we would consult the database that has been collated by Umlando. These databases contains archaeological site locations and basic information from several provinces (information from Umlando surveys and some colleagues), most of the national and provincial monuments and battlefields in Southern Africa (http://www.vuvuzela.com/googleearth/monuments.html) and cemeteries in southern Africa (information supplied by the Genealogical Society of Southern Africa). We use 1st and 2nd edition 1:50 000 topographical and 1937 aerial photographs where available, to assist in general location and dating of buildings and/or graves. The database is in Google Earth format and thus used as a quick reference when undertaking desktop studies. Where required we would consult with a local data recording centre, however these tend to be fragmented between different institutions and areas and thus difficult to access at times. We also consult with an historical architect, palaeontologist, and an historian where necessary.

The survey results will define the significance of each recorded site, as well as a management plan.

All sites are grouped according to low, medium, and high significance for the purpose of this report. Sites of low significance have no diagnostic artefacts or features. Sites of medium significance have diagnostic artefacts or features and these sites tend to be sampled. Sampling includes the collection of artefacts for future analysis. All diagnostic pottery, such as rims, lips, and decorated sherds are sampled, while bone, stone, and shell are mostly noted. Sampling usually occurs on most sites. Sites of high significance are excavated and/or extensively sampled. Those sites that are extensively sampled have high research potential, yet poor preservation of features.

Defining significance

Heritage sites vary according to significance and several different criteria relate to each type of site. However, there are several criteria that allow for a general significance rating of archaeological sites.

These criteria are:

1. State of preservation of:

1.1. Organic remains:

1.1.1. Faunal

1.1.2. Botanical

1.2. Rock art

1.3. Walling

1.4. Presence of a cultural deposit

1.5. Features:

1.5.1. Ash Features

1.5.2. Graves

1.5.3. Middens

1.5.4. Cattle byres

1.5.5. Bedding and ash complexes

2. Spatial arrangements:

2.1. Internal housing arrangements

2.2. Intra-site settlement patterns

2.3. Inter-site settlement patterns

3. Features of the site:

3.1. Are there any unusual, unique or rare artefacts or images at the site?

3.2. Is it a type site?

3.3. Does the site have a very good example of a specific time period, feature, or artefact?

4. Research:

4.1. Providing information on current research projects

4.2. Salvaging information for potential future research projects

5. Inter- and intra-site variability

5.1. Can this particular site yield information regarding intra-site variability, i.e. spatial relationships between various features and artefacts?

5.2. Can this particular site yield information about a community's social relationships within itself, or between other communities?

6. Archaeological Experience:

6.1. The personal experience and expertise of the CRM practitioner should not be ignored. Experience can indicate sites that have potentially significant aspects, but need to be tested prior to any conclusions.

7. Educational:

7.1. Does the site have the potential to be used as an educational instrument?

7.2. Does the site have the potential to become a tourist attraction?

7.3. The educational value of a site can only be fully determined after initial test-pit excavations and/or full excavations.

8. Other Heritage Significance:

8.1. Palaeontological sites

8.2. Historical buildings

8.3. Battlefields and general Anglo-Zulu and Anglo-Boer sites

8.4. Graves and/or community cemeteries

8.5. Living Heritage Sites

8.6. Cultural Landscapes, that includes old trees, hills, mountains, rivers, etc related to cultural or historical experiences.

The more a site can fulfill the above criteria, the more significant it becomes. Test-pit excavations are used to test the full potential of an archaeological deposit. This occurs in Phase 2. These test-pit excavations may require further excavations if the site is of significance (Phase 3). Sites may also be mapped and/or have artefacts sampled as a form of mitigation. Sampling normally occurs when the artefacts may be good examples of their type, but are not in a primary archaeological context. Mapping records the spatial relationship between features and artefacts.

RESULTS

DESKTOP STUDY

The desktop study consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. The archaeological database indicates that there are archaeological sites in the general area (fig. 4). Most of these sites in figure 4 (with yellow markers) have been recorded by Umlando and are on SAHRIS. The rest form part of the Natal Museum database. These sites include all types of Stone Age and Iron Age sites. No sites occur in the study area.

No national monuments, battlefields, or historical cemeteries are known to occur in the study area.

The 1937 aerial photographs indicate that there are seven settlements in the footprint (fig. 5). By 1963 (and 1968), there are more settlements and buildings, and these buildings appear to remain to the present (fig. 6). These are listed in Table 1

TABLE 1: LOCATION OF HERITAGE SITES FROM THE DESKTOP STUDY

NAME	LATITUDE	LONGITUDE	DESCRIPTION	Map date
a1	-29.248027121	31.343380947	Settlement	1937
a2	-29.253033677	31.341216584	Settlement	1937
a3	-29.250238930	31.345358280	Settlement	1937
a4	-29.249892920	31.344490706	Settlement	1937
a5	-29.245002964	31.346255821	Settlement	1937
a6	-29.247067703	31.348444463	Settlement	1937
a7	-29.250508222	31.346445679	buildings?	1937
b1	-29.247663003	31.343635989	Buildings	1963
b2	-29.248811299	31.342841625	Buildings	1963
b3	-29.249146584	31.343100429	Buildings	1963
b4	-29.250211918	31.346202289	Buildings	1963
b5	-29.253661867	31.343571026	Buildings	1968
b6	-29.252503338	31.347207239	Buildings	1968
b7	-29.250282531	31.352187567	Buildings	1963
b8	-29.251640700	31.352036247	Buildings	1968
b9	-29.253968963	31.345360222	Buildings	1968
h1	-29.246548364	31.343594890	Settlement	1963
h2	-29.247392856	31.353473161	Settlement	1963
h3	-29.248505528	31.353936785	Settlement	1963
h4	-29.249501730	31.352900900	Settlement	1963

FIG. 4: LOCATION OF KNOWN HERITAGE SITES NEAR THE STUDY AREA

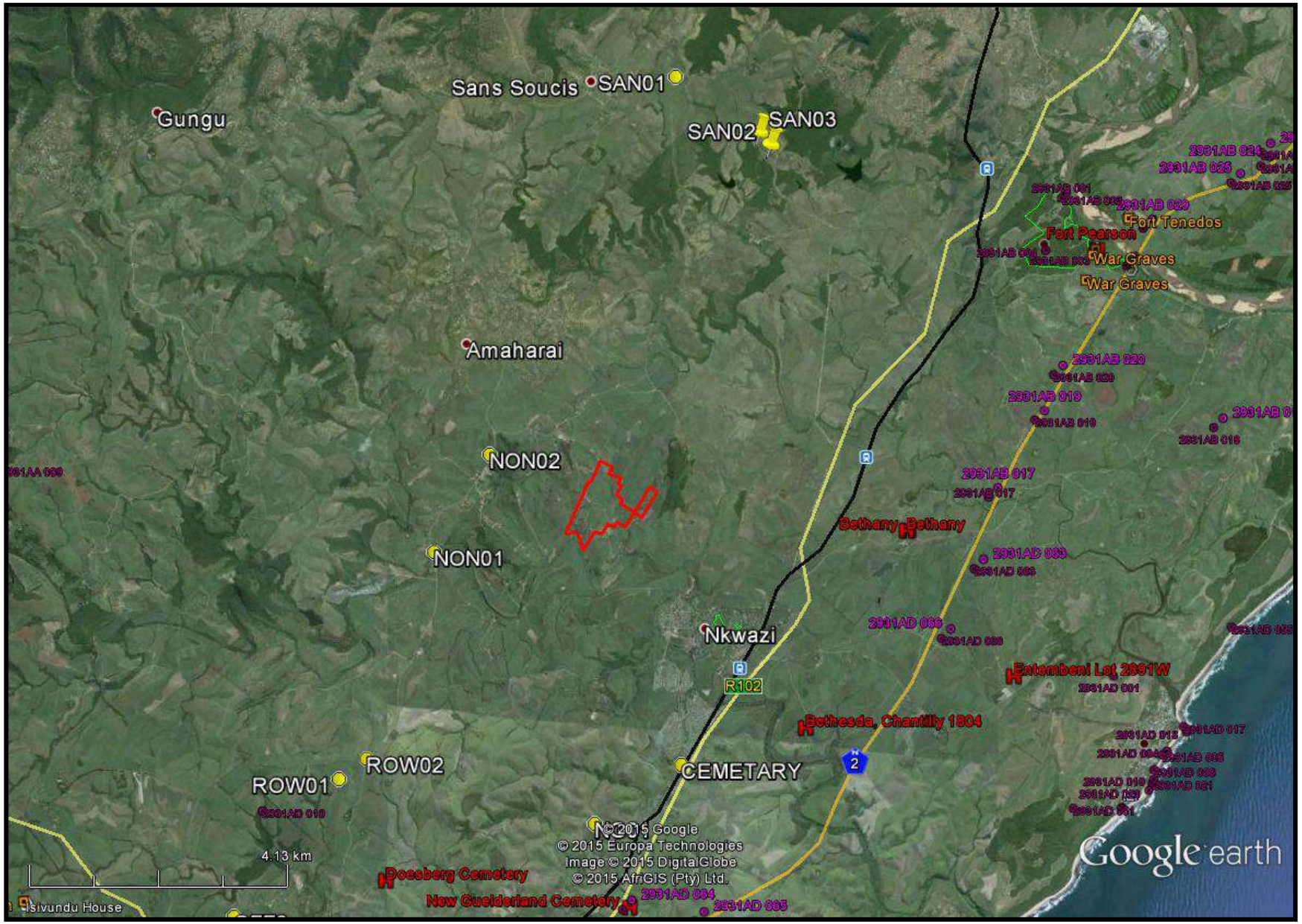


FIG. 5: STUDY AREA IN 1937

FIG. 6: STUDY AREA IN 1963 & 1968

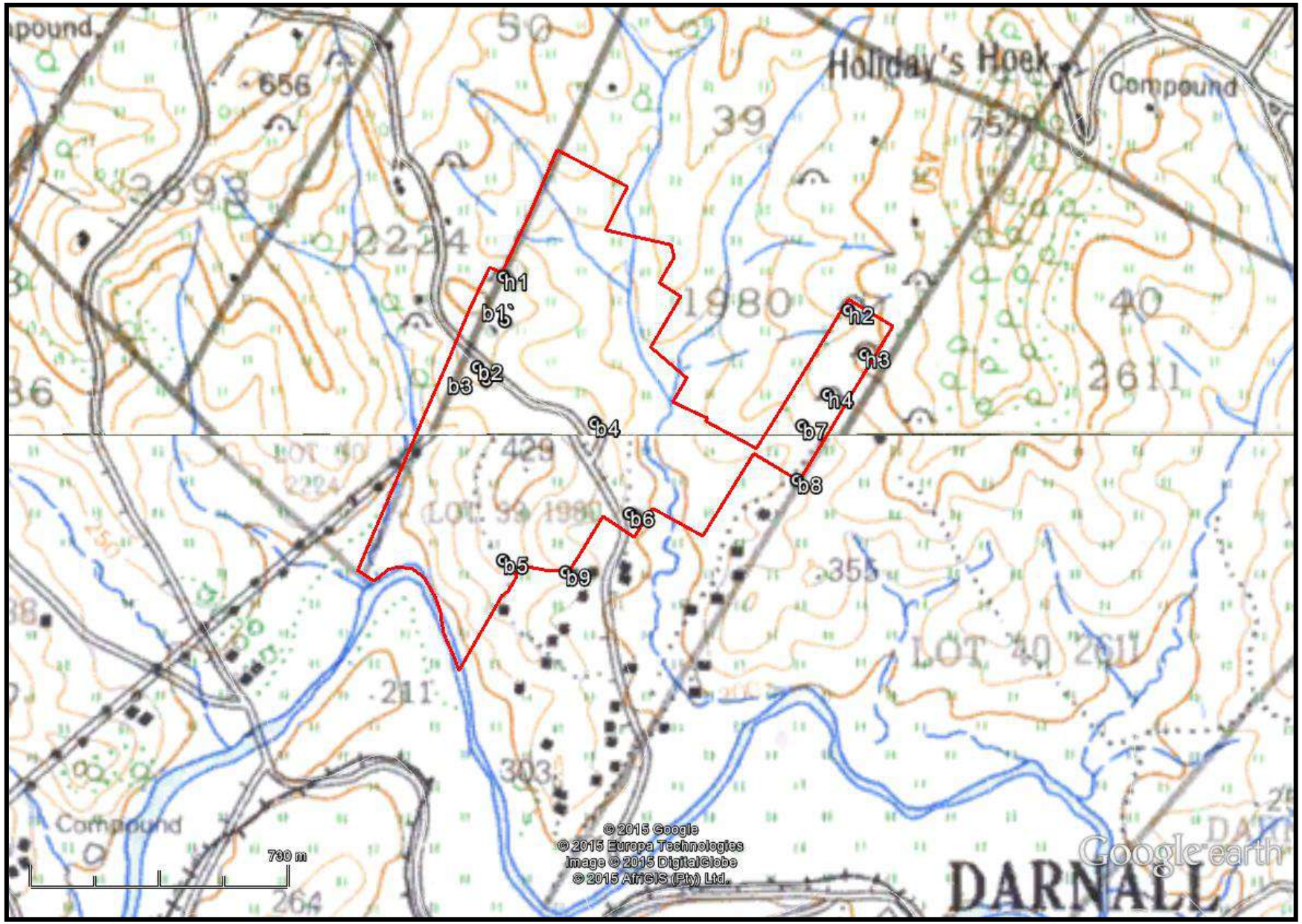


FIG. 7: VIEWS OF THE STUDY AREA

FIELD SURVEY

All of the heritage sites noted from the desktop study have been built over or no longer exist due to sugar cane farming. The occasional 20th century ceramic fragment and glass bottle fragment was noted but this is not unusual. One indeterminate Stone Age flake on shale was observed and two pieces of pottery (fig. 8) that are probably from the same pot were noted. The pottery probably dates from the last 150 – 200 years.

The dearth of artefacts and or archaeological sites in this specific area is not surprising. The soils tend to be shallow and pebbly/rocky and these tend to be non-favoured soil types by hunter-gatherers and Early and Late Iron Age farmers.

FIG. 8: POTTERY SHERDS FROM THE STUDY AREA

PALAENTOLOGY

"The footprint of the proposed construction of the Nyathikazi Rural Housing Development in the KwaDukuza Local Municipality in the KwaZulu-Natal Province is underlain by Ordovician to Silurian aged quartzites of the Natal Group and Permian aged shale of the Pietermaritzburg Formation, Ecca Group, of the Karoo Supergroup. Although rare, significant fossils have been described from the Pietermaritzburg Formation, with specific reference to trace fossils. Recording of fossils from the construction site will contribute significantly to our understanding of the palaeo-environments that existed in this part of the Karoo basin during the Permian" (Groenewald Appendix A).

If excavations exceed 2m, then "it is likely that the Pietermaritzburg Formation will be exposed. A Moderate Palaeontological Sensitivity is allocated to the development site" (Groenewald Appendix A).

All areas where the excavations expose bedrock or where geotechnical surveys indicate that shale of the Pietermaritzburg Formation will be exposed during excavation, will need to be assessed. According to the PIA report the ECO needs to inspect these areas for fossils. If the ECO or EAP is not capable of identifying fossils then a professional Palaeontologist must be appointed to record and collect the fossils according to SAHRA and AMAFA specifications as part of a Phase 1 Palaeontological Impact Assessment. This is likely to occur where the excavations exceed 2m in depth.

CONCLUSION

A heritage survey was undertaken for the proposed housing project. No heritage sites were observed along the route and no further mitigation is required.

If excavations for the houses and/or servitudes extend beyond 2m they are likely to reach fossil bearing bedrock. If this is the case a qualified palaeontologist should assess these areas for fossil remains as per the heritage legislation. If

APPENDIX A

DESKTOP PALAEONTOLOGICAL IMPACT ASSESSMENT

DESKTOP PALAEONTOLOGICAL ASSESSMENT FOR THE PROPOSED NYATHIKAZI RURAL HOUSING DEVELOPMENT ON THE FARM LOT 39, 1980 OWNED BY THE KWADUKUZA LOCAL MUNICIPALITY WITHIN THE ILEMBE DISTRICT MUNICIPALITY, KWAZULU-NATAL PROVINCE.

FOR

Umlando

DATE: 22 May 2015

By

Gideon Groenewald

Cell: 082 339 9202

EXECUTIVE SUMMARY

Gideon Groenewald was appointed to undertake a desktop survey, assessing the potential Palaeontological Impact of the proposed construction of the Nyathikazi Rural Housing Development which will involve the construction of approximately 741 new low cost housing residential units and supporting facilities on Portion 2, 3, 4, 5, 6, 7, 8, 9, 10, 11,13, 17, 18, 22, 23, 27, 29, 32, 36, 38, 39, 40, 44 and 47 of the Farm Lot 39, 1980 owned by the KwaDukuza Local Municipality in the Ilembe District Municipality, KwaZulu-Natal Province.

The footprint of the proposed construction of the Nyathikazi Rural Housing Development in the KwaDukuza Local Municipality in the KwaZulu-Natal Province is underlain by Ordovician to Silurian aged quartzites of the Natal Group and Permian aged shale of the Pietermaritzburg Formation, Ecca Group, of the Karoo Supergroup. Although rare, significant fossils have been described from the Pietermaritzburg Formation, with specific reference to trace fossils. Recording of fossils from the construction site will contribute significantly to our understanding of the palaeo-environments that existed in this part of the Karoo basin during the Permian.

It is expected that excavations for the foundations of buildings will be deeper than 2 m, and it is likely that the Pietermaritzburg Formation will be exposed. A Moderate Palaeontological Sensitivity is allocated to the development site.

Recommendations:

1. The EAP and ECO of the project must be informed of the fact that mainly trace fossils have been described from the Pietermaritzburg Formation that underlies the development site.
2. All sections of the development where bedrock is exposed due to erosion or where geotechnical surveys indicate that shale of the Pietermaritzburg Formation will be exposed during excavation, must be inspected by the ECO and if fossils are recorded, a professional Palaeontologist must be appointed to record and collect the fossils according to SAHRA and AMAFA specifications as part of a Phase 1 Palaeontological Impact Assessment.

.

TABLE OF CONTENT

TABLE OF FIGURES

LIST OF TABLES

INTRODUCTION

Gideon Groenewald was appointed to undertake a desktop survey, assessing the potential Palaeontological Impact of the proposed construction of the Nyathikazi Rural Housing Development which will involve the construction of approximately 741 new low cost housing residential units and supporting facilities on Portion 4, 5, 7, 8, 9, 10, 11, 13, 17, 18, 27, 29, 32, 36, 38, 39, 40, 43, 44, 46 and 47 of the Farm Lot 39, 1980 owned by the KwaDukuza Local Municipality in the Ilembe Districy Municipality, KwaZulu-Natal Province (Figure 1).

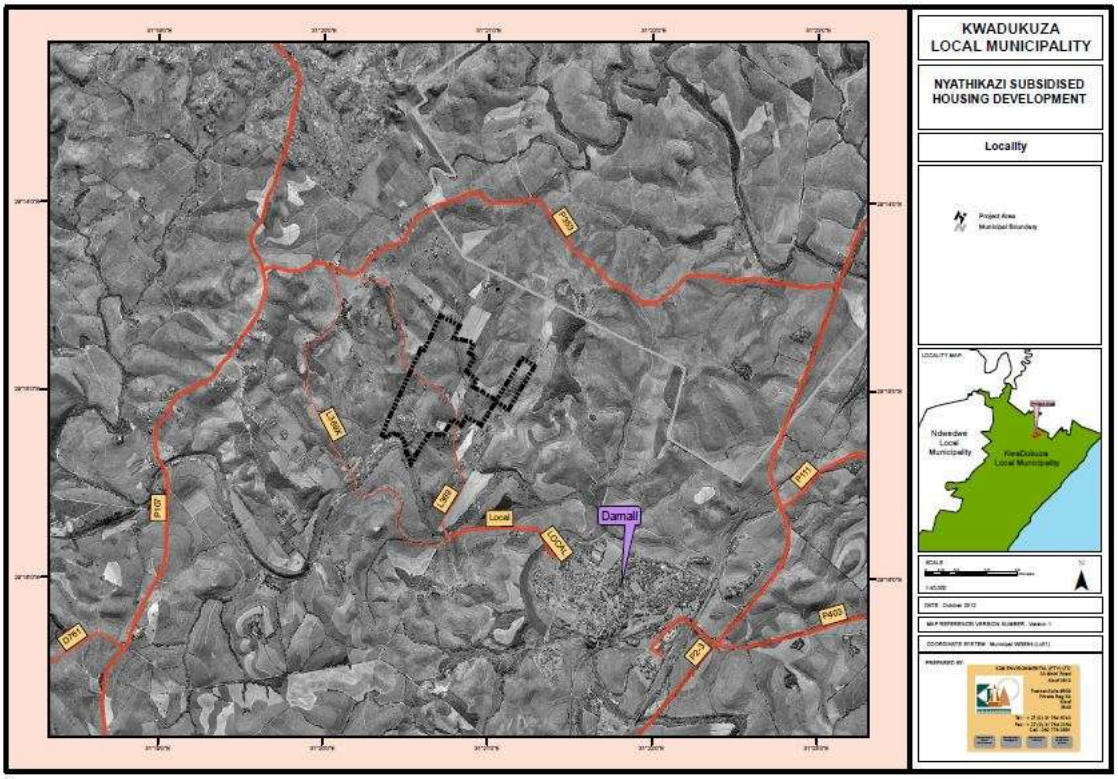


Figure 1 Locality of the Nyatikazi Housing development site

SOUTH AFRICAN NATIONAL HERITAGE RESOURCE ACT NO 25/1999 AND KWAZULU-NATAL HERITAGE ACT NO 4/2008

This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999 as well as the KwaZulu-Natal Heritage Act No 4 of 2008. In accordance with Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), a HIA is

required to assess any potential impacts to palaeontological heritage within the development footprint.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

METHODOLOGY

Following the "SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports" the aims of the palaeontological impact assessment are:

- to identify exposed and subsurface rock formations that are considered to be palaeontologically significant;
- to assess the level of palaeontological significance of these formations;
- to comment on the impact of the development on these exposed and/or potential fossil resources and
- to make recommendations as to how the developer should conserve or mitigate damage to these resources.

In preparing a palaeontological desktop study the potential fossiliferous rock units (groups, formations etc) represented within the study area are determined from geological maps and Google Earth imagery. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience.

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 below.

Table 1 Palaeontological sensitivity analysis outcome classification

PALAEONTOLOGICAL SIGNIFICANCE/VULNERABILITY OF ROCK UNITS	
The following colour scheme is proposed for the indication of palaeontological sensitivity classes. This classification of sensitivity is adapted from that of Almond et al 2008.	
RED	Very High Palaeontological sensitivity/vulnerability. Development will most likely have a very significant impact on the Palaeontological Heritage of the region. Very high possibility that significant fossil assemblages will be present in all outcrops of the unit. Appointment of professional palaeontologist, desktop survey, phase I Palaeontological Impact Assessment (PIA) (field survey and recording of fossils) and phase II PIA (rescue of fossils during construction) as well as application for collection and destruction permit compulsory.
ORANGE	High Palaeontological sensitivity/vulnerability. High possibility that significant fossil assemblages will be present in most of the outcrop areas of the unit. Fossils most likely to occur in associated sediments or underlying units, for example in the areas underlain by Transvaal Supergroup dolomite where Cenozoic cave deposits are likely to occur. Appointment of professional palaeontologist, desktop survey and phase I Palaeontological Impact Assessment (field survey and collection of fossils) compulsory. Early application for collection permit recommended. Highly likely that a Phase II PIA will be applicable during the construction phase of projects.
GREEN	Moderate Palaeontological sensitivity/vulnerability. High possibility that fossils will be present in the outcrop areas of the unit or in associated sediments that underlie the unit. For example areas underlain by the Gordonia Formation or undifferentiated soils and alluvium. Fossils described in the literature are visible with the naked eye and development can have a significant impact on the Palaeontological Heritage of the area. Recording of fossils will contribute significantly to the present knowledge of the development of life in the geological record of the region. Appointment of a professional palaeontologist, desktop survey and phase I PIA (ground proofing of desktop survey) recommended.

BLUE	Low Palaeontological sensitivity/vulnerability. Low possibility that fossils that are described in the literature will be visible to the naked eye or be recognized as fossils by untrained persons. Fossils of for example small domal Stromatolites as well as micro-bacteria are associated with these rock units. Fossils of micro-bacteria are extremely important for our understanding of the development of Life, but are only visible under large magnification. Recording of the fossils will contribute significantly to the present knowledge and understanding of the development of Life in the region. Where geological units are allocated a blue colour of significance, and the geological unit is surrounded by highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a blue colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in larger alluvium deposits. Collection of a representative sample of potential fossiliferous material is recommended.
GREY	Very Low Palaeontological sensitivity/vulnerability. Very low possibility that significant fossils will be present in the bedrock of these geological units. The rock units are associated with intrusive igneous activities and no life would have been possible during implacement of the rocks. It is however essential to note that the geological units mapped out on the geological maps are invariably overlain by Cenozoic aged sediments that might contain significant fossil assemblages and archaeological material. Examples of significant finds occur in areas underlain by granite, just to the west of Hoedspruit in the Limpopo Province, where significant assemblages of fossils and clay-pot fragments are associated with large termite mounds. Where geological units are allocated a grey colour of significance, and the geological unit is surrounded by very high and highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a grey colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. It is important that the report should also refer to archaeological reports and possible descriptions of palaeontological finds in Cenozoic aged surface deposits.

When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a field-based assessment by a professional palaeontologist is usually warranted.

The key assumption for this desktop study is that the existing geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps used were not intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing.

These factors may have a major influence on the assessment of the fossil heritage significance of a given development and, without supporting field assessments, may lead to either:

- an underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or
- an overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by weathering, or are buried beneath a thick mantle of unfossiliferous “drift” (soil, alluvium etc).

GEOLOGY

The study area is underlain by Ordovician to Silurian aged quartzites of the Natal Group and Permian aged shale of the Pietermaritzburg Formation, Ecca Group, of the Karoo Supergroup, (Figure 2).

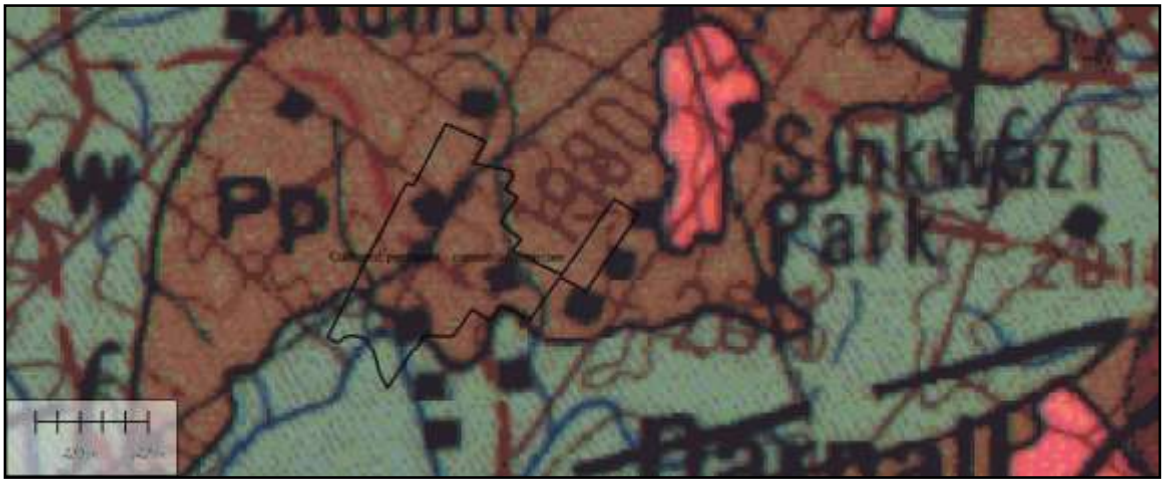


Figure 2 Geology of the proposed development site

Natal Group (blue colour on map)

The Ordovician to Silurian aged Natal Group consists mainly of quartzite formations.

Pietermaritzburg Formation (Pp)

The Permian aged Pietermaritzburg Formation is an assemblage of fine-grained sediments, consisting mainly of dark grey mudstone and shale. The deposits represent Permian aged marine deposits in this part of Gondwanaland (Johnson et al, 2009).

Offshore shelf, but possibly also nearshore / lacustrine / lagoonal deposits.

PALAEONTOLOGY

Natal Group

No significant fossils have to date been recorded from the Natal Group sediments (Johnson et al. 2009).

Pietermaritzburg Formation (Pp)

Fossils are generally absent from the Formation although trace fossils have been recorded from the upper layers of the Pietermaritzburg Formation by Linstrom (1987).

DISCUSSION

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews. Although fossils are rarely recorded from the Pietermaritzburg Formation, the recording of trace fossils and other fossils from this part of the Ecca Basin will contribute significantly to our understanding of the palaeo-environments that existed during the Permian.

MANAGEMENT PLAN

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1.

The palaeontological sensitivity of the development is related to the specific geology that underlies the development footprints. For the sake of this desktop survey it is assumed that there are no significant outcrops on site, but that trenching of up to 2m depth will in fact expose fresh bedrock of the Pietermaritzburg Formation during the construction phase. The recording of fossils from the development site will have a significant impact on our understanding of the palaeo-environments in this part of Gondwanaland and, although the likelihood of finding fossils is small, a Medium Palaeontological sensitivity is allocated to the site.

The palaeontological sensitivity of the study area is shown in Figure 3.

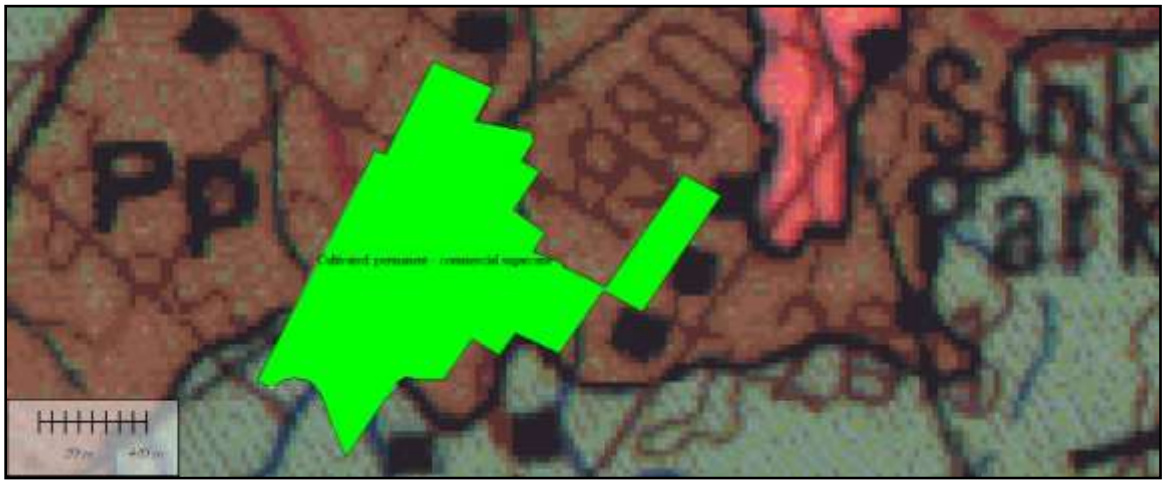


Figure 3 A Moderate Palaeontological Sensitivity is allocated to the development site. The colour coding is explained in Table 1 above.

CONCLUSION AND RECOMMENDATIONS

The footprint of the proposed construction of the Nyathikazi Rural Housing Development in the KwaDukuza Local Municipality in the KwaZulu-Natal Province is underlain by Ordovician to Silurian aged quartzites of the Natal Group and Permian aged shale of the Pietermaritzburg Formation, Ecca Group, of the Karoo Supergroup. Although rare, significant fossils have been described from the Pietermaritzburg Formation, with specific reference to trace fossils. Recording of fossils from the construction site will contribute significantly to our understanding of the palaeo-environments that existed in this part of the Karoo basin during the Permian.

It is expected that excavations for the foundations of buildings will be deeper than 2 m, and it is likely that the Pietermaritzburg Formation will be exposed. A Moderate Palaeontological Sensitivity is allocated to the development site.

Recommendations:

1. The EAP and ECO of the project must be informed of the fact that mainly trace fossils have been described from the Pietermaritzburg Formation that underlies the development site.
2. All sections of the development where bedrock is exposed due to erosion or where geotechnical surveys indicate that shale of the Pietermaritzburg Formation will be exposed during excavation, must be inspected by the ECO and if fossils are recorded, a professional Palaeontologist must be appointed to

record and collect the fossils according to SAHRA and AMAFA specifications as part of a Phase 1 Palaeontological Impact Assessment.

REFERENCES

Johnson MR , Anhaeusser CR and Thomas RJ (Eds). 2009. The Geology of South Africa. GSSA, Council for Geoscience, Pretoria.

Linstrom W. 1987 Die Geologie van die gebied Durban.. Explanation Sheet 2930 (1:250 000). Geological Survey of South. Africa.

QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeo-ecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

DECLARATION OF INDEPENDENCE

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

Dr Gideon Groenewald
Geologist